

**Multiple Choice**

Identify the choice that best completes the statement or answers the question.

1. State the dimensions of the matrix. Identify the indicated element.

$$A = \begin{bmatrix} -9 & 4 \\ -7 & 0 \\ -8 & 8 \end{bmatrix}, a_{2,1}$$

- a.  $3 \times 2, 0$  b.  $2 \times 3, -7$  c.  $2 \times 3, 4$  d.  $3 \times 2, -7$
2. How many elements are in an  $m \times n$  matrix?  
a.  $m+n$  b.  $n^2$  c.  $m^2$  d.  $mn$
3. A matrix contains 60 elements. Which of the following *cannot* equal the number of rows of the matrix?  
a. 30 b. 60 c. 10 d. 18

**Find the sum or difference.**

4.  $\begin{bmatrix} 4 & 7 \\ -5 & 1 \end{bmatrix} - \begin{bmatrix} -3 & -2 \\ 0 & 6 \end{bmatrix}$

a.  $\begin{bmatrix} 1 & 5 \\ -5 & 7 \end{bmatrix}$  b.  $\begin{bmatrix} 7 & 9 \\ -5 & -5 \end{bmatrix}$  c.  $\begin{bmatrix} 7 & 9 \\ -5 & 5 \end{bmatrix}$

d.  $\begin{bmatrix} 1 & 5 \\ -5 & 7 \end{bmatrix}$

5. Suppose  $A$  and  $B$  are  $2 \times 5$  matrices. Which of the following are the dimensions of the matrix  $A + B$ ?  
a.  $2 \times 5$  b.  $10 \times 10$  c.  $7 \times 1$  d.  $7 \times 7$

**Use matrices  $A$ ,  $B$ , and  $C$ . Find the sum or difference if you can.**

$$A = \begin{bmatrix} -5 & 4 \\ -8 & 2 \end{bmatrix} \quad B = \begin{bmatrix} -2 & 7 & -3 \\ 1 & -6 & 0 \end{bmatrix} \quad C = \begin{bmatrix} 5 & 3 & -1 \\ -3 & 0 & 6 \end{bmatrix}$$

6.  $C - B$

a. not possible b.  $\begin{bmatrix} -7 & -4 & -2 \\ 4 & -6 & 6 \end{bmatrix}$

c.  $\begin{bmatrix} 7 & 4 & 2 \\ -4 & 6 & -6 \end{bmatrix}$  d.  $\begin{bmatrix} 7 & -4 & 2 \\ -4 & 6 & 6 \end{bmatrix}$

**Find the values of the variables.**

7.  $\begin{bmatrix} 4 & 3 \\ -1 & 2 \end{bmatrix} = \begin{bmatrix} 4 & y \\ x & 2 \end{bmatrix}$

- a.  $x=2, y=4$  b.  $x=-1, y=3$  c.  $x=4, y=2$   
d.  $x=3, y=-1$

8.  $\begin{bmatrix} 3+t & 0 \\ 8 & -10 \end{bmatrix} = \begin{bmatrix} -5 & 0 \\ 8 & -2y+2 \end{bmatrix}$

- a.  $t=-8, y=4$  b.  $t=6, y=-8$  c.  $t=-2, y=6$   
d.  $t=-8, y=6$

**Solve the matrix equation.**

9.  $\begin{bmatrix} 5 & -7 \\ 1 & 9 \end{bmatrix} + X = \begin{bmatrix} 4 & 4 \\ 7 & 5 \end{bmatrix}$

a.  $\begin{bmatrix} -1 & 11 \\ 6 & -4 \end{bmatrix}$  b.  $\begin{bmatrix} 9 & -11 \\ 8 & 14 \end{bmatrix}$  c.  $\begin{bmatrix} -1 & -3 \\ 6 & -4 \end{bmatrix}$

d.  $\begin{bmatrix} 1 & -11 \\ -6 & 4 \end{bmatrix}$

$$10. -2X + 3 \begin{bmatrix} 2 & -8 \\ -4 & 2 \end{bmatrix} = \begin{bmatrix} 4 & -6 \\ 2 & -8 \end{bmatrix}$$

$$a. \begin{bmatrix} -5 & -9 \\ -7 & 1 \end{bmatrix} \quad b. \begin{bmatrix} 1 & -9 \\ -7 & 7 \end{bmatrix} \quad c. \begin{bmatrix} 1 & -9 \\ 5 & 1 \end{bmatrix}$$

$$d. \begin{bmatrix} 1 & 15 \\ 5 & 7 \end{bmatrix}$$

$$11. \begin{bmatrix} 1 & -1 \\ 2 & -3 \end{bmatrix} X = \begin{bmatrix} -4 \\ 8 \end{bmatrix}$$

$$a. \begin{bmatrix} 20 \\ 16 \end{bmatrix} \quad b. \begin{bmatrix} -20 \\ -16 \end{bmatrix} \quad c. \begin{bmatrix} 20 \\ -16 \end{bmatrix} \quad d. \begin{bmatrix} -4 \\ 8 \end{bmatrix}$$

$$12. \begin{bmatrix} -3 & -14 \\ 2 & 9 \end{bmatrix} X = \begin{bmatrix} 8 & -4 \\ 0 & -4 \end{bmatrix}$$

$$a. \begin{bmatrix} 72 & -92 \\ -16 & 20 \end{bmatrix} \quad b. \begin{bmatrix} 72 & -92 \\ 0 & -4 \end{bmatrix}$$

$$c. \begin{bmatrix} -72 & 92 \\ -16 & 20 \end{bmatrix} \quad d. \begin{bmatrix} -3 & -92 \\ -16 & 9 \end{bmatrix}$$

Find the product.

$$13. \begin{bmatrix} 2 & 5 & -8 \end{bmatrix} \begin{bmatrix} -6 \\ 8 \\ 2 \end{bmatrix}$$

$$a. \begin{bmatrix} 2 & -6 \\ 5 & 8 \\ -8 & 2 \end{bmatrix} \quad b. \begin{bmatrix} -12 \\ 40 \\ -16 \end{bmatrix} \quad c. \begin{bmatrix} 2 & 5 & -8 \\ -6 & 8 & 2 \end{bmatrix}$$

$$d. [12]$$

$$14. \begin{bmatrix} 4 & 0 \\ 9 & 8 \end{bmatrix} \begin{bmatrix} -5 & -1 \\ -1 & -2 \end{bmatrix}$$

$$a. \begin{bmatrix} -45 & -8 \\ -9 & -16 \end{bmatrix} \quad b. \begin{bmatrix} -20 & -4 \\ -53 & -25 \end{bmatrix}$$

$$c. \begin{bmatrix} -20 & -4 \\ -25 & -53 \end{bmatrix} \quad d. \begin{bmatrix} -20 & 0 \\ -4 & 0 \end{bmatrix}$$

Determine whether the product is defined or undefined. If defined, give the dimensions of the product matrix.

$$15. \begin{bmatrix} 1 & 1 & -4 \\ 5 & 6 & 0 \end{bmatrix} \begin{bmatrix} 9 \\ 1 \\ -7 \end{bmatrix}$$

a. defined;  $3 \times 3$  b. defined;  $2 \times 1$  c. defined;  $2 \times 3$  d. undefined

$$16. \begin{bmatrix} 4 & 5 \\ 9 & -2 \end{bmatrix} \begin{bmatrix} 1 & 7 \end{bmatrix}$$

a. defined;  $2 \times 2$  b. defined;  $2 \times 1$  c. defined;  $1 \times 2$  d. undefined

Find the coordinates of the image after a reflection in the given line.

$$17. \begin{bmatrix} 7 & -3 & -1 \\ -1 & 0 & -6 \end{bmatrix}; y\text{-axis}$$

$$a. \begin{bmatrix} -1 & 0 & -6 \\ 7 & -3 & -1 \end{bmatrix} \quad b. \begin{bmatrix} -7 & 3 & 1 \\ -1 & 0 & -6 \end{bmatrix}$$

$$c. \begin{bmatrix} 1 & 3 & -7 \\ -1 & 0 & -6 \end{bmatrix} \quad d. \begin{bmatrix} 7 & -3 & -1 \\ -6 & 0 & -1 \end{bmatrix}$$

18.  $\begin{bmatrix} 9 & -7 & 1 \\ 7 & 5 & -3 \end{bmatrix}; y = x$

a.  $\begin{bmatrix} 9 & -7 & 1 \\ 1 & -7 & 9 \end{bmatrix}$  b.  $\begin{bmatrix} -3 & 5 & 7 \\ 1 & -7 & 9 \end{bmatrix}$

c.  $\begin{bmatrix} -3 & 5 & 7 \\ 9 & -7 & 1 \end{bmatrix}$  d.  $\begin{bmatrix} 7 & 5 & -3 \\ 9 & -7 & 1 \end{bmatrix}$

19.  $\begin{bmatrix} -5 & -3 & -3 \\ -6 & 1 & -2 \end{bmatrix}; y\text{-axis}$

a.  $\begin{bmatrix} 5 & 3 & 3 \\ -2 & 1 & -6 \end{bmatrix}$  b.  $\begin{bmatrix} -2 & 1 & -6 \\ -5 & -3 & -3 \end{bmatrix}$

c.  $\begin{bmatrix} 5 & 3 & 3 \\ -6 & 1 & -2 \end{bmatrix}$  d.  $\begin{bmatrix} 3 & 3 & 5 \\ -6 & 1 & -2 \end{bmatrix}$

20. Find the coordinates of the image after the given rotation.

$\begin{bmatrix} -9 & 3 & 0 \\ 0 & -6 & 9 \end{bmatrix}; 270^\circ$

a.  $\begin{bmatrix} 0 & -6 & 9 \\ 0 & -3 & 9 \end{bmatrix}$  b.  $\begin{bmatrix} 9 & -6 & 0 \\ 9 & -3 & 0 \end{bmatrix}$

c.  $\begin{bmatrix} 9 & -6 & 0 \\ -9 & 3 & 0 \end{bmatrix}$  d.  $\begin{bmatrix} 0 & -6 & 9 \\ 9 & -3 & 0 \end{bmatrix}$

Which of the following is the multiplicative inverse of the given matrix?

21.  $\begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$

a.  $\begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$  b.  $\begin{bmatrix} 1 & -2 \\ 0 & 1 \end{bmatrix}$  c.  $\begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$

d.  $\begin{bmatrix} 1 & -2 \\ 0 & -1 \end{bmatrix}$

Evaluate the determinant of the matrix.

22.  $\begin{bmatrix} 4 & -1 \\ -9 & 2 \end{bmatrix}$

a. 17 b. 1 c. -1 d. -17

Determine whether the matrix has an inverse. If an inverse exists, find it.

23.  $\begin{bmatrix} -5 & -18 \\ 2 & 7 \end{bmatrix}$

a.  $\begin{bmatrix} 7 & 18 \\ -2 & 5 \end{bmatrix}$  b.  $\begin{bmatrix} -5 & -18 \\ -2 & -5 \end{bmatrix}$  c. does not exist

d.  $\begin{bmatrix} 7 & 18 \\ -2 & -5 \end{bmatrix}$

Evaluate the determinant.

24.  $\begin{vmatrix} 4 & 4 \\ 5 & 5 \\ 2 & 5 \\ 3 & 3 \end{vmatrix}$

a.  $\frac{20}{3}$  b.  $-\frac{4}{3}$  c.  $-\frac{20}{3}$  d.  $\frac{4}{3}$

Use Cramer's Rule to solve the system.

25.  $\begin{cases} 7x + 2y = 0 \\ 4x + y = -11 \end{cases}$

a.  $\begin{bmatrix} 77 \\ -22 \end{bmatrix}$  b. no solution c.  $\begin{bmatrix} 22 \\ -77 \end{bmatrix}$  d.  $\begin{bmatrix} -22 \\ 77 \end{bmatrix}$

26. 
$$\begin{cases} 2x + y = -16 \\ x - y = -5 \end{cases}$$

a.  $\begin{bmatrix} -2 \\ -7 \end{bmatrix}$  b. no solution c.  $\begin{bmatrix} -7 \\ -2 \end{bmatrix}$  d.  $\begin{bmatrix} 7 \\ 2 \end{bmatrix}$

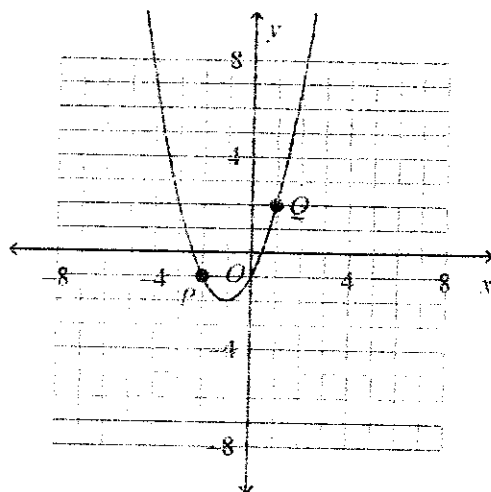
Determine whether the function is linear or quadratic. Identify the quadratic, linear, and constant terms.

27.  $f(x) = (3x + 2)(-6x - 3)$

- a. linear function  
linear term:  $-21x$   
constant term:  $-6$
- b. quadratic function  
quadratic term:  $-18x^2$   
linear term:  $-21x$   
constant term:  $-6$
- c. quadratic function  
quadratic term:  $6x^2$   
linear term:  $24x$   
constant term:  $-6$
- d. linear function  
linear term:  $-18x^2$   
constant term:  $-6$

Identify the vertex and the axis of symmetry of the parabola. Identify points corresponding to  $P$  and  $Q$ .

28.



- a.  $(-1, -2)$ ,  $x = -1$   
 $P(0, -1)$ ,  $Q(-3, 2)$
- b.  $(-2, -1)$ ,  $x = -2$   
 $P(-2, -1)$ ,  $Q(-1, 2)$
- c.  $(-1, -2)$ ,  $x = -1$   
 $P(-2, -1)$ ,  $Q(-1, 2)$
- d.  $(-2, -1)$ ,  $x = -2$   
 $P(0, -1)$ ,  $Q(-3, 2)$

29. Find a quadratic function to model the values in the table. Predict the value of  $y$  for  $x = 6$ .

$x$	$y$
-1	2
0	-2
3	10

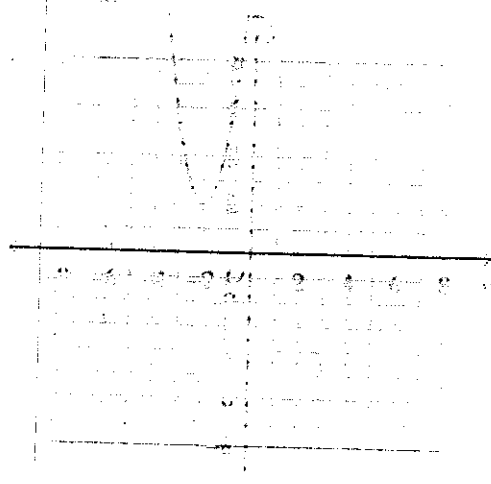
- a.  $y = -2x^2 + 2x - 2$  -58
- b.  $y = 2x^2 - 2x - 2$  60 c.  $y = 2x^2 - 2x - 2$  58
- d.  $y = -2x^2 + 2x + 2$  -58

30. Dalco Manufacturing estimates that its weekly profit,  $P$ , in hundreds of dollars, can be approximated by the formula  $P = -3x^2 + 6x + 10$ , where  $x$  is the number of units produced per week, in thousands.

- a. How many units should the company produce per week to earn the maximum profit?
- b. Find the maximum weekly profit.

- a. 1,000 units; \$1300 b. 3,000 units; \$100 c. 1,000 units; \$600 d. 2,000 units; \$1100

31. Use vertex form to write the equation of the parabola.



- a.  $y = 3(x - 2)^2 + 2$  b.  $y = 3(x - 2)^2 + 2$   
c.  $y = 3(x + 2)^2 + 2$  d.  $y = (x + 2)^2 + 2$

32. Identify the vertex and the y-intercept of the graph of the function  $y = -3x + 2x^2 + 1$ .

- a. vertex:  $(-2, 5)$   
y-intercept:  $-7$   
b. vertex:  $(2, -5)$   
y-intercept:  $-12$   
c. vertex:  $(2, 5)$   
y-intercept:  $-7$   
d. vertex:  $(-2, -5)$   
y-intercept:  $9$

33. Write  $y = 2x^2 + 12x + 14$  in vertex form.

- a.  $y = 2(x + 12)^2 + 14$  b.  $y = (x + 9)^2 - 4$   
c.  $y = (x + 3)^2 + 14$  d.  $y = (x + 3)^2 - 4$

Write the equation of the parabola in vertex form.

34. vertex  $(-4, 3)$ , point  $(4, 131)$

- a.  $y = 2(x + 4)^2 + 3$  b.  $y = 2(x - 4)^2 + 3$   
c.  $y = 4(x - 4)^2 + 3$  d.  $y = 131(x + 4)^2 - 3$

35. vertex  $(0, 3)$ , point  $(-4, -45)$

- a.  $y = -4x^2 + 3$  b.  $y = -3x^2 + 3$   
c.  $y = -45x^2 - 3$  d.  $y = -3x^2 - 3$

Factor the expression.

36.  $-15x^2 + 21x$   
a.  $3x(-15x + 21)$  b.  $-15x(x + 7)$  c.  $-3x(5x + 7)$   
d.  $5x(x - 2 + 7)$

37.  $4x^2 + 12x + 9$   
a.  $(2x + 4)^2 + 12x + 16$  b.  $(2x + 12)^2 + 16$   
c.  $2x(2x + 3)$  d.  $4(-2x^2 - 3x + 4)$

38.  $x^2 + 14x + 49$   
a.  $(x + 6)^2 - 6$  b.  $(x + 8)^2 - 6$   
c.  $(x - 8)^2 - 6$  d.  $(x + 6)^2 + 6$

39.  $x^2 - 12x + 36$   
a.  $(x + 4)(x - 2)$  b.  $(x - 2)(x - 4)$   
c.  $(x - 4)(x + 2)$  d.  $(x - 2)(x + 4)$

40.  $3x^2 + 7x + 2$   
a.  $(3x + 5)(2x + 7)$  b.  $(3x + 7)(2x + 5)$   
c.  $(3x + 5)(x + 7)$  d.  $(3x + 5)(x + 7)$

41.  $5x^2 - 32x + 16$   
a.  $(5x + 3)(x + 5)$  b.  $(x + 3)(5x - 5)$   
c.  $(5x + 3)(x - 5)$  d.  $(5x - 5)(x - 3)$

42.  $9x^2 - 4$   
a.  $(3x + 4)(3x - 4)$  b.  $(3x + 4)(3x - 4)$   
c.  $(3x + 4)(3x - 4)$  d.  $(3x - 4)^2$

43. Solve by factoring.

$$4x^2 + 24x - 32 = 0$$

- a.  $-\frac{1}{2}$  b.  $-\frac{1}{2}$  c.  $-8, 1$  d.  $1, -\frac{1}{2}$

44. Simplify  $\sqrt{-175}$  using the imaginary number  $i$ .

- a.  $i\sqrt{175}$  b.  $5i\sqrt{7}$  c.  $5\sqrt{-7}$  d.  $-5\sqrt{7}$

Write the number in the form  $a + bi$ .

45.  $\sqrt{-4} + 10$   
a.  $4 + 10i$  b.  $10 + i\sqrt{4}$  c.  $10 + 2i$  d.  $2 + 10i$

46.  $-6 - \sqrt{-48}$   
a.  $6 + i\sqrt{48}$  b.  $-6 - 4i\sqrt{3}$  c.  $6 - 4i\sqrt{3}$   
d.  $-6 + 4i\sqrt{3}$